



(11) AU-A 29955/77

(12) PATENT SPECIFICATION  
ABSTRACT  
(19) AU

(21) 29955/77 (22) 25.10.76 (23) 21.10.77 (24) 25.10.76  
(43) 26.4.79  
(51) B62D 1/18  
(54) STEERING COLUMN  
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(57) CLAIM

1. An energy absorbing automotive steering column formed by first and second tubes characterised in that the tubes are dimensioned so that the end portion of one can encircle the end portion of the other with a space there between, further characterised in that the said first tube has an end portion displaced from the plane of the wall of the tube toward the said second tube to form a friction grip on the first tube and by guide means between the first tube and the second tube remote from the said friction grip to align the one tube axially with the other tube.

COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1969

# COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Class

Int. Class

Application Number :  
Lodged :

Complete Specification Lodged :  
Accepted :  
Published :

Priority:

Related Art :

TO BE COMPLETED BY APPLICANT

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Complete Specification for the invention entitled:

"ENERGY ABSORBING AUTOMOTIVE STEERING COLUMN"

The following statement is a full description of this invention, including the best method of performing it known to me. us.

This invention relates to an energy absorbing automotive steering column.

5 Energy absorbing steering columns have in the past been of various types, including columns which have in them collapsible members such as corrugated tubular members which collapsed when the required axial pressure was exerted, or the columns were of a type that one member could move axially in relation to another member under a controlled force to allow collapsing of the system in this way.

10 In earlier work carried out by us a device was proposed in which an inner member and an encircling tubular outer member, were held in a fixed relationship one to the other by at least one joining annular disc which frictionally interconnected the two members, see Australian Patent No. 449074, but was so disposed that if axial force or forces were applied to the members such that the resultant force is in excess of the frictional holding force, the said annular disc or discs deflected to reduce the frictional engagement, allowing movement of one member in respect to the other with controlled energy absorption.

20 The present invention relates to further improvements to a device of the type outlined above, but instead of using a disc or discs, a first tube and a second tube which are dimensioned such that the end portion of one can be positioned over the end portion of the other with a space there between are arranged so that one can move

axially in the other and guide means are provided in one of the tubular members, which maintain the axial position while the one tube also has a friction grip, preferably formed as a partly-domed or flared end on the tube, the tube which is engaged by the shaped tube having preferably a small taper so that there is no fall off in load from the spring effect of the friction grip end portion of the tube, with the contact area of the friction grip being machined to a small radius to give a high bearing force to eliminate the effect on friction by oil or grease.

The actual loading is controlled by the profile of the friction grip and trials have indicated that variation in diameters has little effect on the collapsing loads provided a minimum interference is maintained.

To enable the invention to be fully appreciated an embodiment thereof will now be described with reference to the accompanying drawings which illustrate two forms of the invention.

In the drawings;

Fig. 1 is a longitudinal part central section of a first and preferred embodiment, and

Fig. 2 is a similar view of a second embodiment.

Referring first to Fig. 1 it will be seen that the first tube 1 is an outer tube which is curved inwards at that end which is adapted to engage the inner tube to provide what we term a friction grip 2, which in this embodiment is inwardly domed, and some distance back

along this outer tube are constrictions which form a guide 3 which engages the inner tube 4 to serve to maintain the first tube 4 in exact axial alignment with the second tube 4.

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The inner tube 1 in this case is tapered between the end 5 and beyond where it engages within the friction end 2 of the outer tube, and the taper is as said, arranged to ensure that there is no fall-off in loading from the required effect where this is a desirable feature.

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The first tube 1 in this case thus has a domed friction end 2 and a guide portion 3 back from its end both formed out of the plane of the tube wall in an inward direction, and the deformed portions act to engage the outer surface of the inner tube with the required grip.

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Obviously as shown in Fig. 2 the first tube could be the inner tube and the second tube the outer tube, in which case the inner tube 7 has an outwardly flared end to form the friction grip 8 corresponding to the domed end which forms the friction grip 2 in that embodiment and has outwardly displaced portions some distance back from the end to form guides 9 to maintain the axial alignment between the two tubes, the outer tube 10 in this case being tapered inwards from the end 11 to control the progressive action as one tube moves within the other tube.

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The device the subject of this invention is simpler and more compact than the earlier device in that it

involves only the shaping of one of the tubes, but if required, the tapering of the other to achieve the required progressive energy absorbing action, and the system has the advantage that whereas in the earlier types of collapsible columns where a member folded during an impact, the action can be much closer controlled by tapering of the tubes or similar effects to ensure that progressive absorption of the energy remains within the limits required for any particular purpose.

While it is preferred to shape the end of the first tube to form the friction grip it is possible for instance to weld a ring of a different material to the end of the tube, which ring has the required configuration.

From the foregoing it will be realised that a simple and effective device is provided which will serve as an energy absorbing steering column, and in which a very high degree of control is possible particularly as the friction grip profile on the tube can be machined to close tolerances.



The Claims defining the invention are as follows:-

1. An energy absorbing automotive steering column formed by first and second tubes characterised in that the tubes are dimensioned so that the end portion of one can encircle the end portion of the other with a space there between, further characterised in that the said first tube has an end portion displaced from the plane of the wall of the tube toward the said second tube to form a friction grip on the first tube and by guide means between the first tube and the second tube remote from the said friction grip to align the one tube axially with the other tube.

2. An energy absorbing automotive steering column according to claim 1 characterised in that the said first tube is the outer tube and the friction grip is formed by partially drawing the end of the first tube inwards to engage the outer wall of the said second tube.

3. An energy absorbing automotive steering column according to claim 1 characterised in that the said first tube is the inner tube and the friction grip is formed by flaring the end of the first tube outwards to engage the inner wall of the said second tube.

4. An energy absorbing automotive steering column according to any preceding claim characterised in that the said guide means are formed by displacing a portion of the said first tube remote from the friction grip into contact with the said second tube.

5. An energy absorbing automotive steering column according to any preceding claim characterised in that the said guide means are upset from the said first tube.

6. An energy absorbing automotive steering column according to any preceding claim characterised in that the said friction grip is an annular extension of the said first tube secured thereto to form a continuation of the said tube.

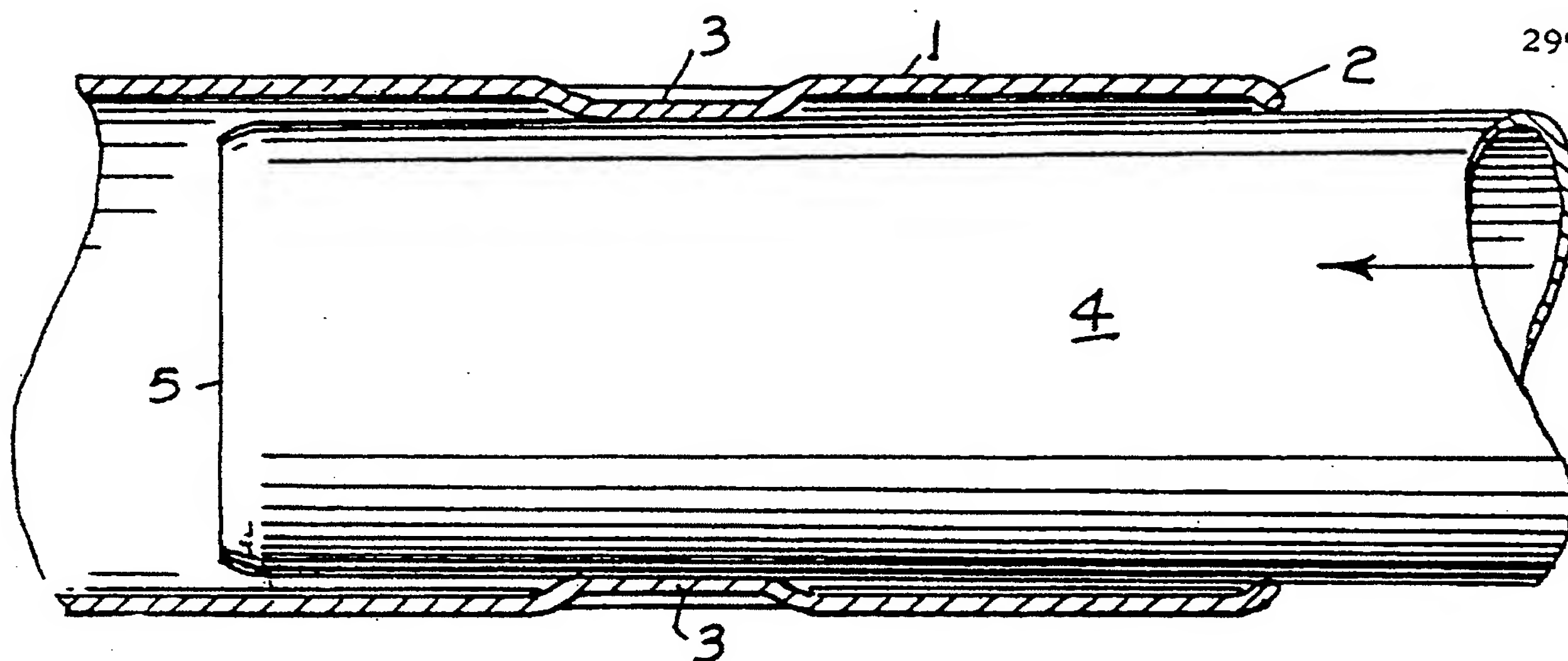
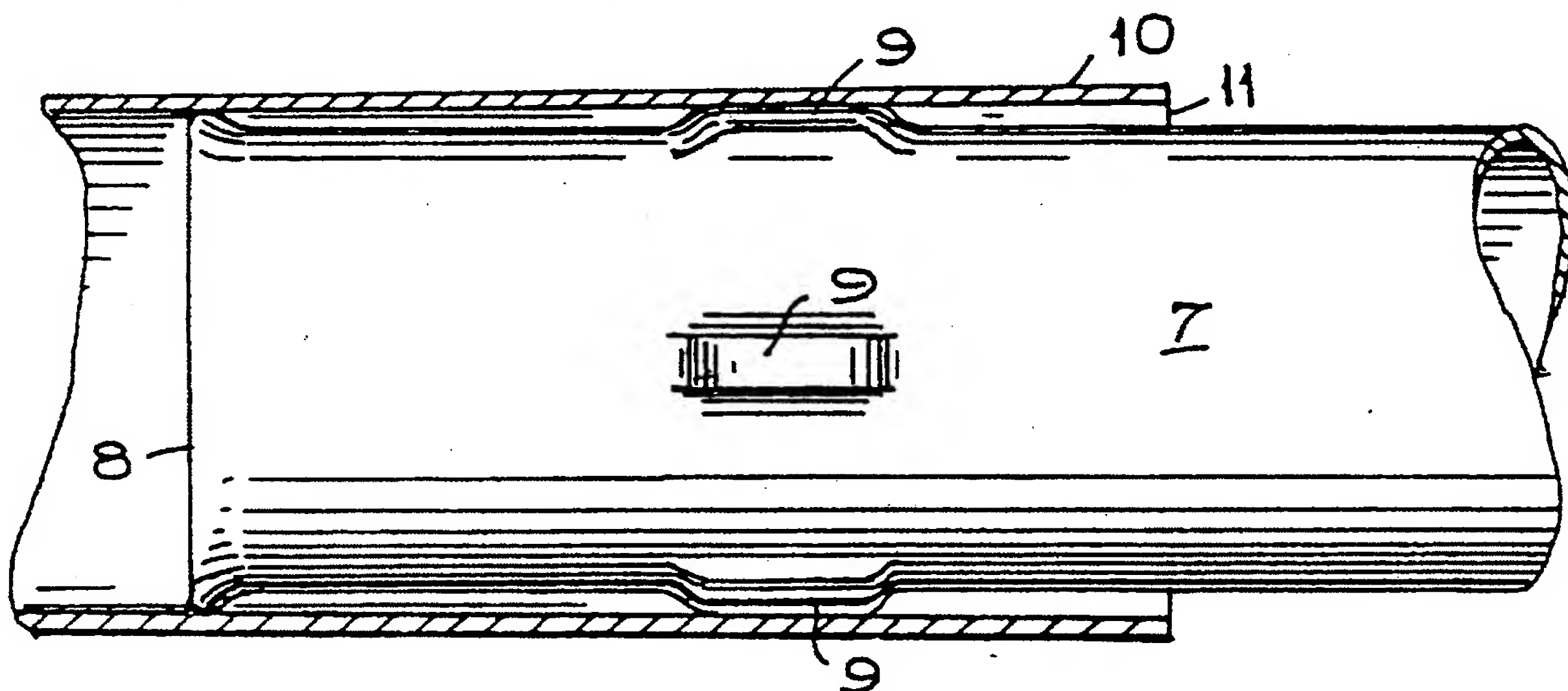
7. An energy absorbing automotive steering column constructed and operating substantially as described with reference to and as illustrated in Fig. 1.

8. An energy absorbing automotive steering column constructed and operating substantially as described with reference to and as illustrated in Fig. 2.

Dated this 20th day of October, 1977

TUBEMAKERS OF AUSTRALIA LIMITED  
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**FIG. 1****FIG. 2**

